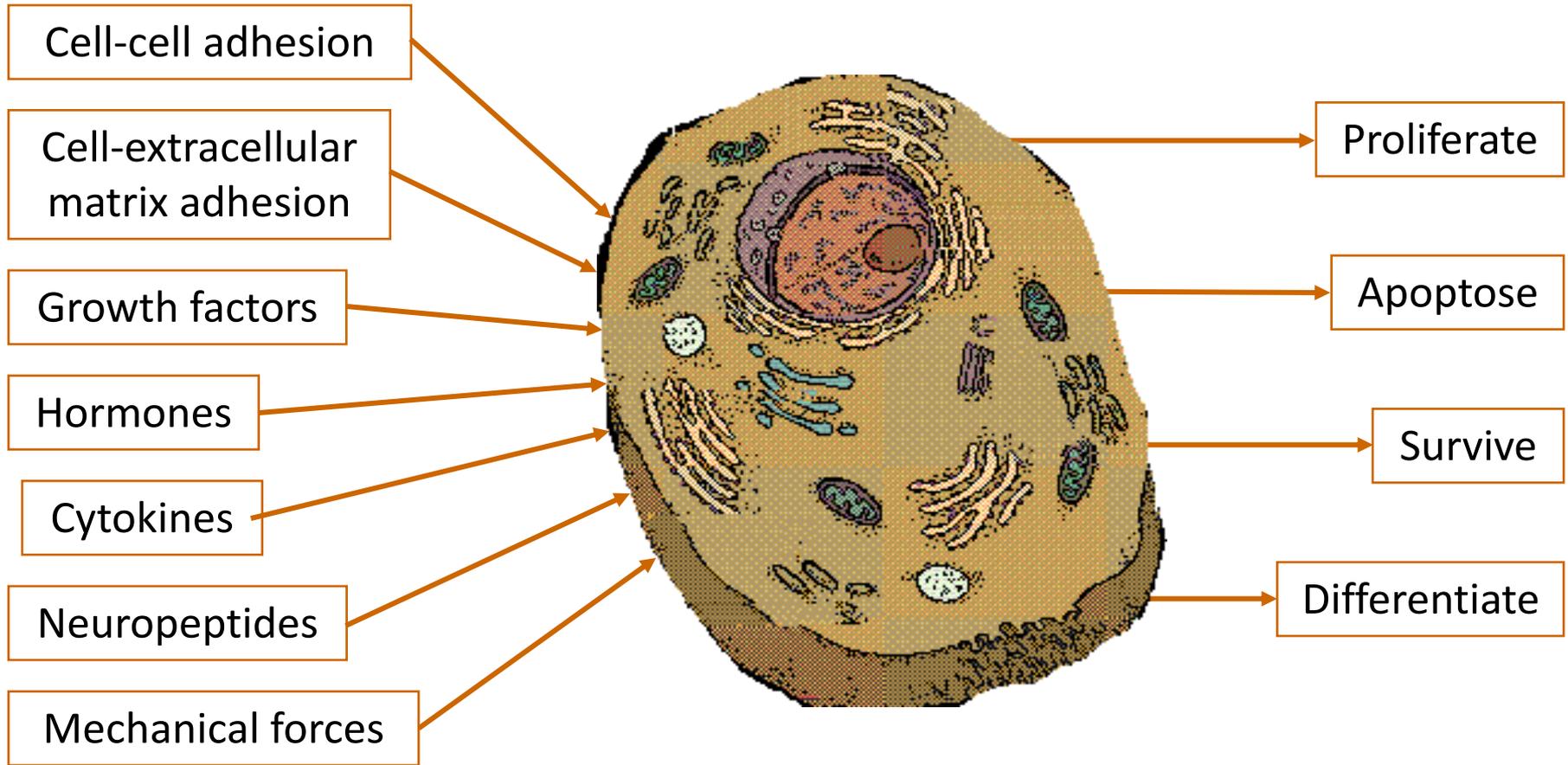


A space-themed background featuring a large, reddish-brown planet (Mars) in the upper right, a smaller purple planet in the lower left, and a field of stars in a dark blue space.

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2013 NASA Space Radiation Summer
School

Integration of multiple growth signals



The ability to integrate information from multiple sources is essential to the cell's ability to respond appropriately to a wide range of conditions and hence promote the adaptability and survival of the organism

Decisions of a Cell

Like an tentative young student, cells are constantly checking for both internal and external signals that will direct their path through life. During homeostasis, cells receive many signals that are processed and ultimately dictate whether a cell should differentiate, divide, survive, or die.

- Intracellular signals

- Cell cycle checkpoints stop cells at various stages during cell division to determine whether or not the cell will progress through the cell cycle
- Following exposure to ionizing radiation, a cell will likely receive DNA damage. This damage is assessed at several different stages of the cell cycle. If a cell detects damage, the cell cycle will pause and DNA repair pathways are activated to ensure that the daughter cells inherit only one copy of each chromosome. Should the damage be irreparable, the cell will undergo apoptosis.

- Extracellular signals

- This slide demonstrates extracellular factors that are received by the cell, such as cell-cell adhesion, cell-extracellular matrix adhesion, growth factors, hormones, cytokines, neuropeptides, and mechanical forces.
- These signals initiate intracellular signaling pathways that affect gene transcription and ultimately leads to differentiation, division, survival, or death.

Cells incorporate intracellular and extracellular signals to decide their fate during both homeostasis and following radiation-induced injury.

- My thesis project looks at the effects of ionizing radiation on stem cells in the lung. This slide is of interest to me because I felt it clearly demonstrates the complex interactions cells have with their surrounding environment. This influences the decisions a cell is forced to make following radiation, which then goes on to affect surrounding cells in the tissue. I am fascinated with the cell's ability to integrate these signals in an efficient way and respond appropriately.